BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : **NAME 317** (Design of Marine Vehicles)

Full Marks: 210   Time : 3 Hours

The figures in the margin indicate full marks.

Assume reasonable value of any missing data. The symbols have their usual meaning.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) What is the philosophy behind engineering design?   **(5)**

    (b) Describe elaborately common features of engineering design.   **(20)**

    (c) Cite some limitations in engineering design.   **(10)**

2. (a) Describe elaborately the design procedure for a container ship.   **(25)**

    (b) Estimate the dimensions of a tanker of deadweight 230,000 tonnes.   **(10)**

3. (a) Derive the expression of the change in C_B per metre of draught.   **(10)**

    (b) Estimate the dimensions of a bulk carrier of total deadweight 23,000 tonnes with a
    service speed of 14 knots. Assume $C_D = 0.80$.   **(20)**

    (c) Distinguish between concept design and preliminary design.   **(5)**

4. (a) What are the advantages and disadvantages of different types of marine diesel
    engine?   **(11)**

    (b) Describe how you will calculate machinery weight.   **(12)**

    (c) Show with neat sketches officer, petty officer and crew accommodations.   **(12)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Mention the components of light ship weight.   **(5)**

    (b) A ship is of dimensions, length = 125 m, breadth = 17.2 m, depth = 11.3 m with a
    steel weight of 2500 tonne. Calculate the steel weight of a proposed design with
    length = 130 m, breadth = 18 m and depth = 12 m.   **(25)**

    The correction for dimensions is based on the assumption that the steel weight, 85% is
    affected by length, 55% by breadth and 35% by depth.

    (c) A ship is of dimensions, length = 137 m and breadth = 19.5 m with a wood and outfit
    weight of 970 tonne. Calculate the wood and outfit weight of a proposed design with
    length = 152 m and breadth = 20.5 m.   **(5)**

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6. (a) Define Grain capacity and Bale capacity of a Cargo ship. **(5)**

(b) A ship is of length = 120 m, breadth = 19 m, depth = 9.5 m, draught = 7.35 m and block coefficient = 0.72. Calculate the grain and bale capacity of the ship in m³. **(20)**

Given:

Sheer forward + Sheer aft = 3.9 m

Camber = 0.36 m

Double bottom depth + Ceiling = 1.07 m

Machinery space and tunnel = 2000 m³

Cross bunker = 160 m³

Hatches = 140 m³.

(c) A basis ship of length = 300 ft, breadth = 45 ft, draught = 18.5 ft has a displacement of 4900 tons and a midship area coefficient of 0.975. A new design with the same length, breadth, draught and midship area coefficient is to have a displacement of 5025 tons by the insertion of parallel body. Calculate the required length of parallel body. **(10)**

7. A ship has the following particulars: **(35)**

Length = 450 ft

Breadth = 60 ft

Draught = 26 ft

Radius of bilge = 6.5 ft

No rise of floor.

Prismatic coefficient of the after body = 0.72

L.C.B. of after body = 84 ft from midship.

Station	5	6	7	8	9	$9\frac{1}{2}$	F.P.
S. A. Ord.	1.0	1.0	0.995	0.925	0.57	0.26	—
L.W.L. ord	1.0	1.0	1.0	0.982	0.71	0.39	—

Determine for the ship the C_p, L.C.B and displacement. Design transverse section 9 from keel to L.W.L.

8. (a) A vessel is displacing 25,000 tonne and has KG = 9.5 m and KM = 12 m. **(25)**

Heel (deg)	0	5	10	15	30	45	60	75	90
GZ (m)	0	0.21	0.48	0.71	1.62	1.66	0.57	−0.58	−1.97

Does the vessel comply with the Load line regulation while in this condition.

(b) A ship attaining speed of 28 knots required 35,000 shaft horse power. If the specific fuel consumption at this power output is 0.78 lbf/SHP.hr, calculate: **(10)**

(i) fuel required for 500 miles endurance.

(ii) number of hours steaming possible on 1000 tonf of fuel.

(iii) endurance for 1000 tonf. of fuel.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1 B. Sc. Engineering Examinations 20010-2011

Sub : **HUM 313** (Principle of Accounting)

Full Marks : 140   Time : 3 Hours

USE SEPARATE SCRIPTS FOR EACH SECTION

The figures in the margin indicate full marks.

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) "All transactions are events but all events are not transactions." Explain. $(3\frac{1}{3})$

   (b) Show the effects of the following transactions on assets, liabilities and owner's Equity in a good form-   **(20)**

   (i) The Owner invested Tk. 30,000 to start the business.

   (ii) Incurred advertising expanse of Tk. 2000 on account.

   (iii) Purchased furniture of Tk. 20,000 on credit

   (iv) Services have been provided to customers for Tk. 4000 but not received the money.

   (v) Paid cash of Tk. 1,000 to accounts payable

   (vi) Paid one year insurance policy Tk. 1200.

   (vii) Received Tk. 3000 cash for services in (iv).

   (viii) Withdraw for personal use Tk. 1000.

   (ix) Paid monthly rent for the office Tk. 3000.

   (x) Received an order of service which will be performed in the amount to Tk. 5,000.

2. 'M and P Printers' was started on March 1, 2011 by Masum Parvez. The following transactions occurred during the month of March: $(23\frac{1}{3})$

March-1	Invested Tk. 30,000 cash in business.
March-5	Purchased Printing Equipment for cash Tk. 50,000.
March-7	Purchased supplies Tk. 3,000 on account.
March-15	Paid cash Tk. 700 to the daily Star for advertising expense.
March-20	Paid employee salaries Tk. 2000
March-25	Received Tk. 12000 for services that will be provided in April.
March-30	Paid 40% of payable on March-7.

   Required:

   (i) Journalize the March Transactions.

   (ii) Post the journal entries to the ledger.

   (iii) Prepare a trial balance on March 31, 2011.

HUM 313(NAME)

3. (a) What are the reasons behind recording adjusting entries? Discuss with examples. **(3⅓)**

(b) Veer Consulting opened for business on May 1, 2011. It's trial balance before adjustments on May 31 is as follows- **(20)**

<div align="center">

Veer Consulting

Trial Balance

May 31, 2011

</div>

Account Titles	Debit (Tk.)	Credit (Tk.)
Cash	2,500	
Supplies	1,900	
Prepaid Insurance	2,400	
Land	15,000	
Lodge	70,000	
Furniture	16,800	
Accounts payable		5,300
Unearned Rent		3,600
Mortgage payable		35,000
Capital		60,000
Rent Revenue		9,200
Advertising expense	500	
Salaries expense	3,000	
Utilities expense	1,000	
	11,3100	11,3100

Other data:

→ Insurance expires at the rate of Tk. 200 per month.

→ A count of supplies shows Tk. 900 of unused supplies on May 31.

→ Annual depreciation is Tk. 2,400 on the lodge and Tk. 3,000 on furniture.

→ The mortgage interest rate is 12%. The mortgage was taken out on May 1.

→ Unerned rent of Tk. 2,500 has been earned.

→ Salaries of Tk. 800 are accrued and unpaid at May 31.

Required:

(i) Prepare the adjusting entries for the month of May.

(ii) Prepare adjusted trial Balance on May 31, 2011.

HUM 313(NAME)

4. (a) Adjusted trial balance of Eagle Company, owned by Alfred Eagle, is given below- **(20)**

Eagle Company

Adjusted Trial Balance

June 30, 2011

Accounts Title	Debit (Tk.)	Credit (Tk.)
Cash	13,600	
Accounts Receivable	15,400	
Supplies	2,000	
Prepaid Insurance	2,800	
Office Equipment	34,000	
Accumulated Depreciation		8,000
Notes payable		20,000
Accounts payable		6,000
Salaries payable		3,500
Interest payable		800
Capital		25,000
Drawings	10,000	
Service Revenue		88,000
Advertising expense	12,000	
supplies expense	5,700	
Depreciation expense	8,000	
Insurance expense	5,000	
Salaries expense	42,000	
Interest expense	800	
	151,300	151,300

Required:

(i) Prepare an income statement for the year ended on June 30, 2011.

(ii) Prepare an Owner's Equity Statement for the period assuming Alfred Eagle did not make additional investments in the business during the year.

(iii) Prepare classified balance sheet. Assume that Tk. 5,000 of the notes payable become due for payment within next year.

(b) Discuss the importance of Financial Statements Analysis. **(3⅓)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Explain the difference between product cost and Period Cost with example. **(3⅓)**

(b) "A variable cost per unit varies with output, whereas fixed cost per unit is constant" – Explain with examples. **(5)**

(c) Listed below are a number of costs typically found in an organization. **(5)**

(i) Wood used in Producing tables	(ii) Labor cost to assemble the table
(iii) Rent on factory building	(iv) Sales manager's commission
(v) Depreciation of office Equipment	(vi) Advertising expense
(vii) Accountant's salary	(viii) Lubricant's for machine
(ix) Production supervisor's salary	(x) Salary of the CEO

Required:

Classify these costs as either variable or fixed with respect to no. of units produced and sold.

(d) The following information has been taken from the books of X Co. **(10)**

Cost	Amount	Cost	Amount
Selling expense	$140,000	Administrative expenses	$270,000
Raw materials Inventory, Jan-1	90,000	Manufacturing overhead	640,000
Raw materials Inventory, Dec-31	60,000	Work In Process inventory-Jan-1	180,000
Direct labor	150,000	Work In Process inventory, Dec-31	100,000
Purchase of Raw materials	750,000	Finished goods inventory, Jan-1	260,000
Sales	25,00,000	Finished goods inventory, Dec-31	210,000

Required:

Prepare a Schedule of Cost of Goods Sold.

6. (a) What do you mean by the term "break-even point? Draw a CVP graph and specify different terms in the graph. **(6⅓)**

(b) ABC Co. has been experiencing difficulty for some time. The company's recent month's income statement is as follows: **(17)**

Sales (30,000 balls)	$ 750,000
Less: variable expenses	450,000
contribution margin	300,000
Less: Fixed expenses	210,000
Net operating income	90,000

HUM 313(NAME)

Contd ... Q. No. 5(b)

Required:

(i) Compute CM ratio and variable expense ratio

(ii) Compute Break-even point in units and Dollars

(iii) Compute Degree of operating leverage (DOL). If sales are increased by 12%, by what percent will net operating income be increased?

(iv) Refer to the original data, how many units will have to be sold to meet a target profit of $ 90,000?

(v) Refer to the original data, if there is 10% reduction in the selling price, 5% increase in the per unit variable cost and an increase of $ 60,000 in monthly advertising budget; what will be the new break even point in terms of units and dollars?

7. (a) What do you understand by standard? Distinguish between ideal and practical standard. **(6⅓)**

(b) X Ltd. Produced 1,500 units of output on last month. The standard costs associated with one unit of goods are given below: **(17)**

	Standard Quantity or hour	Standard Price or Rate	Standard cost
Direct Material	2.5 pounds	$ 40.00 per pound	$ 100.00
Direct labor	0.7 hours	35.00 per hour	24.50
Variable overhead	0.7 hours	25.00 per hour	17.50
		Standard cost per unit	$ 142.00

The following additional information is available for the month just completed:

(i) Material Purchased 5,000 pounds at a cost of $ 2,10,000.

(ii) There was no beginning inventory of material on hand but at the end of the month it was found that 1,200 pounds of raw material were on hand at the end of the month.

(iii) The Co. appointed 10 workers to produce the goods. In last month, each worker worked at an average of 120 hours at an average rate at $ 32.00 per hour.

(iv) Overhead cost is applied to products on the basis of direct labor hours. Variable manufacturing overhead costs during the month totaled $ 30,000.

Required: Compute the direct material, direct labor and variable manufacturing overhead variances for the month.

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8. (a) What do you mean by cost allocation? Explain different methods of cost allocation. **(5⅓)**

(b) X Ltd. has four departments- of them two are support department (HR and IT) and two production departments (machining and Assembly). The relevant cost data are as follows: **(18)**

	Support Depts.		Production Dept.		Total
	HR	IT	Machining	Assembly	
Costs before allocation (Tk.)	6,00,000	2,00,000	7,00,000	3,00,000	18,00,000
Service work finished:					
By HR (labor hour)	-	400	600	1,000	2,000
		20%	30%	50%	100%
By IT (Computer hour)	100	-	800	100	1,000
	10%	-	80%	10%	100%

Requirement:

Allocate the service department costs, to the production departments using the following methods:

(i) Step-down method

(ii) Reciprocal Service Method.

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2010-2011

Sub.: **NAME 371** (Finite Element Method for Ship Structure)

Full Marks: 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) Derive the expression of strain-displacement matrix of a triangular element by iso-parametric representation. **(20)**

   (b) Assemble the load vector $\overline{F}_{6\times1}$ at the three nodes on the inner boundary, which is subjected to a pressure p = 0.9 MPa as shown in Figure for Q. No. 1(b). **(15)**

2. (a). Derive the shape functions of a four-node isoparametric quadrilateral element. **(10)**

   (b) For the element shown in Figure for Q. No. 2(b), assemble Jacobian matrix and strain-displacement matrix for the Gauss point (0.57735, 0.57735). Then indicate how do you proceed to assemble element stiffness matrix. **(25)**

3. Assemble element stiffness matrix for the plane frame shown in Figure for Q. No. 3. Explain how you proceed further to solve the problem. **(35)**

4. (a) For a four node tetrahedron element, discuss: **(18)**
   (i) Nodal degrees of freedom
   (ii) Shape functions and
   (iii) Strain – Displacement matrix

   (b) Construct the shape functions of a triangular element by area coordinates. **(17)**

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Explain what you mean by 'finite element method'. **(15)**

   (b) What are the steps involved in finite element analysis? **(15)**

   (c) Discuss the attractive features of finite element method. **(5)**

6. (a) Discuss plane stress and plane strain with examples. **(14)**

   (b) Discuss Von Mises stress. **(10)**

   (c) Explain the principle of Rayleigh-Ritz method. **(11)**

7. Explain the elimination method and penalty method of imposing boundary conditions. Comment on the two methods. **(35)**
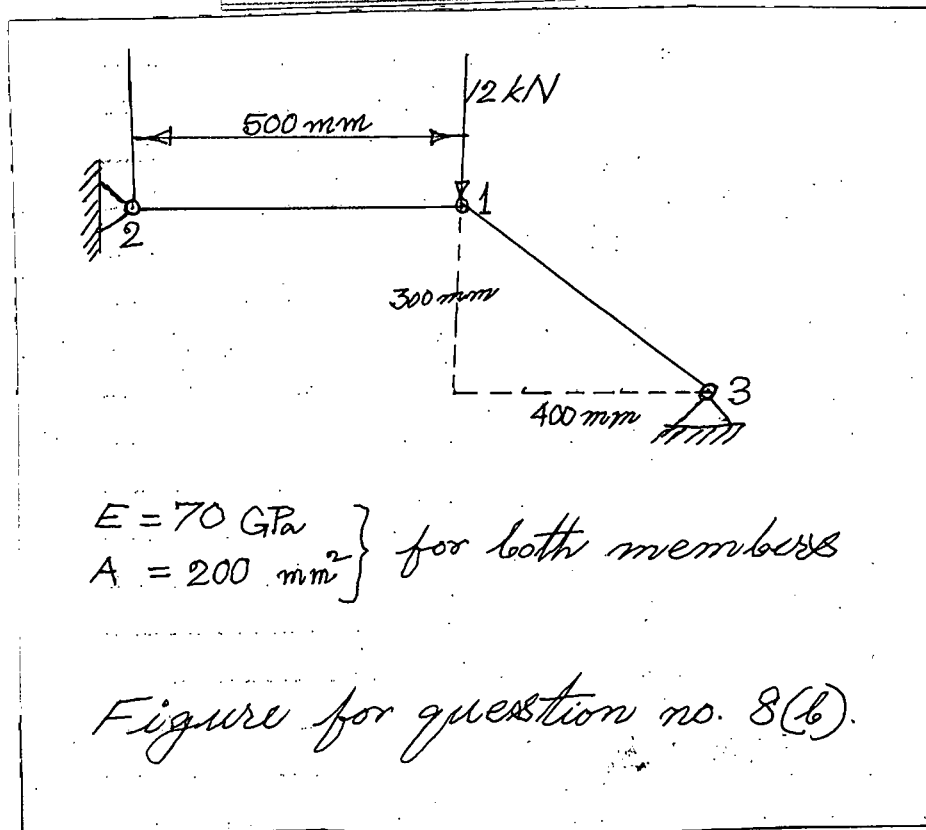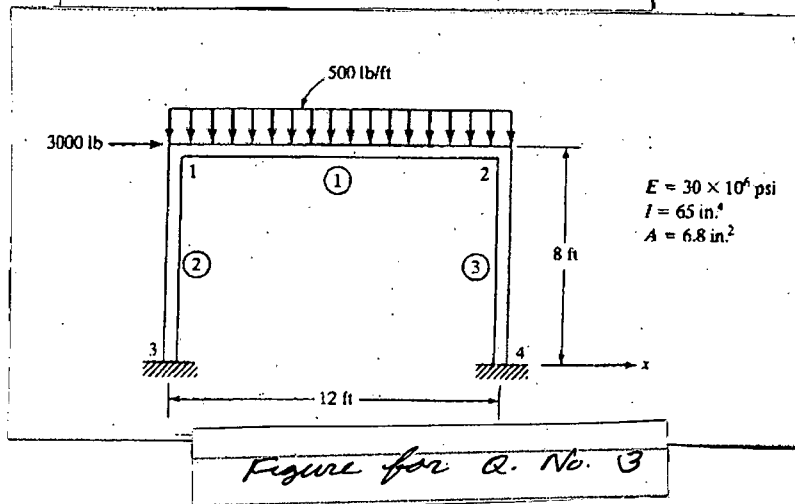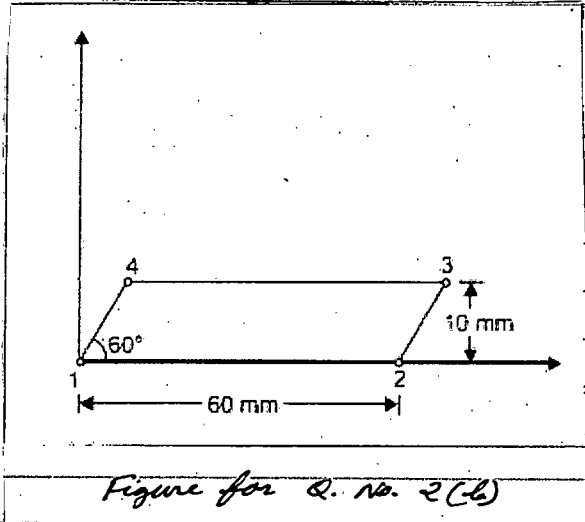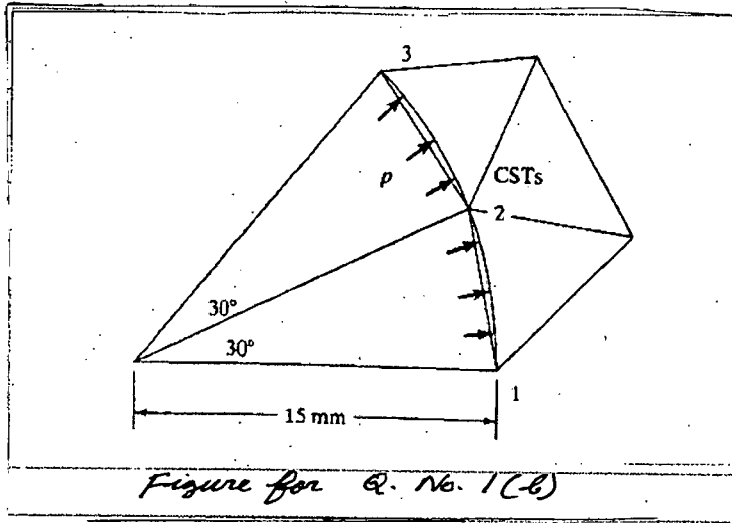
8. (a) Derive the expression of the transformation matrix for plane trusses. **(15)**

   (b) For the two-bar truss shown in Figure for question 8(b), determine the displacements of node 1 and the stress in element 1 – 3. **(20)**

Figure for Q. No. 1(b)

Figure for Q. No. 2(b)

Figure for Q. No. 3

$E = 70$ GPa
$A = 200$ mm^2 } for both members

Figure for question no. 8(b).

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : **NAME 335** (Port and Harbor Engineering)

Full Marks: 210   Time : 3 Hours

The figures in the margin indicate full marks.

USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

Assume reasonable value for any missing data.

1. (a) What are the factors to be considered for planning a port? Briefly explain the factors. **(20)**

   (b) Define port and harbor. Classify different types of ports and harbor. **(10)**

   (c) Why bathemetric survey is important for port planning? **(5)**

2. (a) What factors dictate the size and shape of the harbor? Schematically draw a typical layout for a medium size artificial harbor with full size turning basin. **(15)**

   (b) Describe with neat sketches the most important stages and factors to be considered during layout development of a port. **(20)**

3. A port is to be designed for container vessels. The following are the particulars of the maximum size of a container vessel to be handled by the port: **(35)**

   length (L_{0A}) : 75 m, Beam (B) = 13 m, draft(T) = 3.4 m

   Capacity : 100 TEU

   The following information is also available:

   MHWS : 5.154 m

   MLWS : 0.783 m

   LAT : 0.656 m

   Minimum tidal elevation above reference level = 0.56 m

   PWDD = 0.00

   River current velocity v_c = 1.2 m/sec.

   Waves are small and mostly ship generated. The port is to be designed for thruput 467945 TEU's. Calculate the number of berths, length of berth (Jetty), width of the channel and depth of the channel and hardbor. Assume 2 cranes per berth having productivity 20 moves/hr.

4. (a) Assume a small container terminal to be designed for a capacity of 70,000 TEU/year of which 35,000 TEU for import, 25000 for export and 10,000 TEU Empties. Calculate the area for the Import, Export, Empties and CFS. Draw a possible layout for the above terminal. **(17)**

NAME 335
Contd ... Q. No. 4

(b) A vessel has the following particulars: **(18)**

Deadweight (DWT) : 1000 dwt

Displacement (Δ) : 1690 tonne

Length overall (LOA) : 67 m

Length Between Perpendiculars (L_{BP}) : 62.0 m

Breadth   (B)   : 10.8 m

Max^M draft   (T_m) : 3.9 m

Minimum Freeboard (F) : 1.9 m

Calculate the berthing energy for the following

conditions:

(i)   Favourable conditions of current and wind.
(ii)   Average conditions of current and wind
(iii)   Unfavourable conditions of current and wind.

SECTION – B

There are **FOUR** questions in this Section. Answer any **THREE**.
Symbols have their usual meaning.

5. Why do we need breakwater? Imagine construction of a breakwater in seas where there are high waves, strong currents and winds. How will you construct a breakwater in such an environment? What factors do you think are necessary for selection of breakwaters? With neat sketches explain the construction of rock-mound breakwater of type – 2.   **(35)**

6. Describe three different equations highlighting the relationships among weight of rock, slope of armor course and wave height. On the basis of equations proposed by Iribarren and Hudson, plot curves showing relationships between weight of rock and height of wave for two different slopes of armor course, namely 1:2 and 1:3. The other relevant values are K = 15 and K' = 0.015. Specific gravity of cap rock = 2.73. Coefficient of friction =1. Using the curves so plotted, compare the weights of rock for a wave height of 20 ft.   **(35)**

7. (a) What are the different irregular concrete units? What advantages they have over standard concrete blocks for construction of breakwaters?   **(15)**

(b) What advantages the vertical-type breakwaters have over the sloping type? Show an example of a vertical type breakwater which is better known for its failure. Explain the causes of the failure.   **(20)**

8. Write short notes on the following with sketches (Any three)   **(35)**

(a) Perforated breakwater

(b) Floating, breakwater

(c) Pneumatic breakwater

(d) Dolphin

BANGLADESH UNIVERSITY OF ENGINEERING AND TECHNOLOGY, DHAKA

L-3/T-1   B. Sc. Engineering Examinations 2010-2011

Sub : NAME 319 (Theory of Machines)

Full Marks: 210   Time : 3 Hours

The figures in the margin indicate full marks.
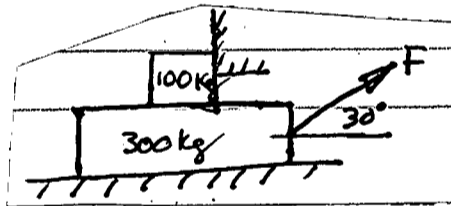
USE SEPARATE SCRIPTS FOR EACH SECTION

SECTION – A

There are **FOUR** questions in this Section. Answer any **THREE**.

1. (a) In the following figures, the body is moving down at uniform rate. If ϕ is greater than α (fig. a) show that $P/W = \dfrac{\sin(\phi - \alpha)}{\cos\phi}$ and $Pl + Wh = \mu Wb$ and if ϕ is less than α

   (fig. b), show that $Wh = \mu Wb + Pl$ **(20)**
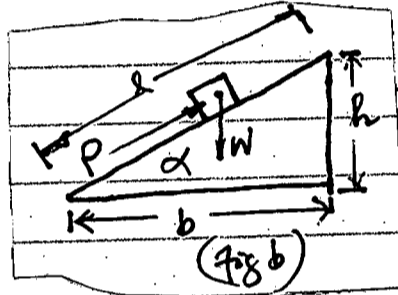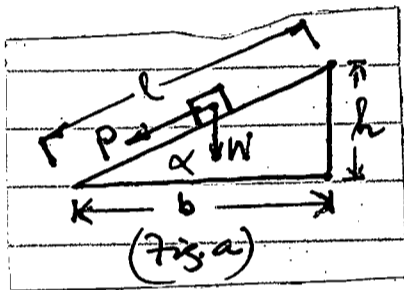
   (b) What force F is needed to get the 300 kg block moving to the right? Given $\mu_s = 0.3$ for all surfaces.   **(15)**


2. A flat belt is installed with an initial tension of 500 lb, the coefficient of friction between belt and pulley is 0.3, the angle of lap on the smaller pulley is 165°, the belt speed is 60 ft/sec and the weight of the belt is 1.2 lb/ft. Find the maximum horsepower which the belt can transmit when the drive is (a) vertical (b) horizontal. Derive any expression used.   **(35)**

3. (a) A wheel of 40 teeth on a lathe spindle gears with a wheel of 50 teeth to which is fixed one of 25 teeth and this gears with a wheel of 95 teeth on the lead screw which is right handed and has four threads per inch. Find the number of threads per inch there would be in a screw cut in the lathe and say what alteration is necessary in the train if the screw is to be left handed.   **(18)**

   (b) To avoid interference, find an expression for the minimum number of teeth to be provided on a pinion and a wheel.   **(17)**

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4. A bevel gear epicyclic is shown below. The wheel A is keyed to the driving shaft, the wheel F to the driven shaft and the wheel E is fixed. The arm G is free to turn and the wheels B, C and D are keyed to the inclined shaft. Wheels A and B are equal; $T_c = 19$, $T_d = 18$, $T_e = 75$, $T_f = 74$. Find the speed of F in terms of the speed of A. What is the speed ratio when $T_e = 81$? You may avoid the drawing of the figure in your script. **(35)**
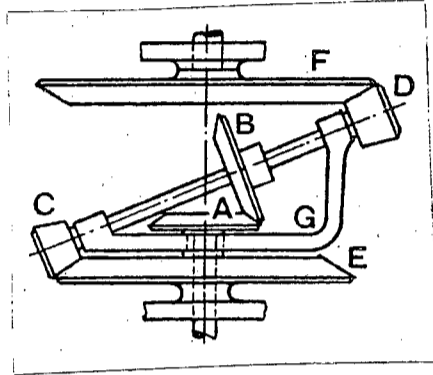
SECTION – B
There are **FOUR** questions in this Section. Answer any **THREE**.

5. (a) Using the principle of conservation of momentum, derive the expression to find the energy lost by a friction clutch during engagement. **(15)**

   (b) Fig. for Q. No. 5(b) shows a flywheel A connected through a torsionally flexible spring to one element C of a dog clutch. The other element D of the clutch is free to slide on the shaft but it must revolve with the shaft to which the flywheel B is keyed. The moment of inertia of A and B are 22.5 kg-m^2 and 67.5 kg-m^2 and the torsional stiffness of the spring is 22.5 kg-m/rad. When the flywheel A is revolving at 150 r.p.m. and the flywheel B is at rest, the dog clutch is suddenly engaged. **(20)**
   Neglecting all losses, find,

   (i) strain energy stored in the spring,

   (ii) the maximum twist of the spring, and

   (iii) the speed of flywheel when the spring regains its initial unstrained condition.

6. (a) What do you understand by centre of percussion? Prove that it lies below the center of gravity of the body and at a distance K_G^2/h, where K_G is the radius of gyration about c.g. and h is the distance between the centre of suspension and c.g. **(20)**

   (b) In a crank and slotted lever quick return mechanism, as shown in Fig. for Q. No. 6(b), the driving crank length is 75 mm. The distance between the fixed centers is 200 mm and the length of the slotted lever is 500 mm. Find the ratio of the times taken on the cutting and idle strokes. Also determine the effective stroke. **(15)**

7. (a) What do you understand by instantaneous centre of rotation in Kinematic of machines? **(5)**

   (b) Locate all the instantaneous centers of the mechanism as shown in Fig. for Q. No. 7(b). The length of various links are as follows: **(30)**

   AB = 150 mm; BC = 300 mm; CD = 225 mm; and CE = 500 mm.

   When the crank AB rotates in the anticlockwise direction at a uniform speed of 240 r.p.m.; find (i) velocity of the slider E, and (ii) angular velocity of the links BC and CE.

8. Fig. for Q. No. 8 shows the mechanism of a moulding press in which OA = 80 mm, AB = 320 mm, BC = 120 mm, BD = 320 mm. The vertical distance of OC is 240 mm and horizontal distance of OD is 160 mm. **(35)**

   When the crank OA rotates at 120 r.p.m. anticlockwise, determine: (i) acceleration of D and angular acceleration of the link BD, and (ii) force available at D, if a torque of 500 N-m acts on OA.
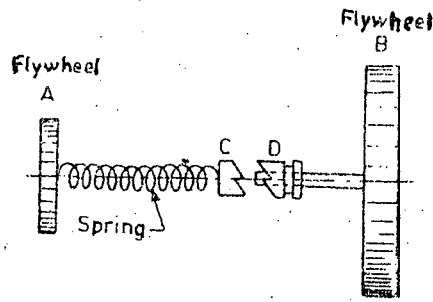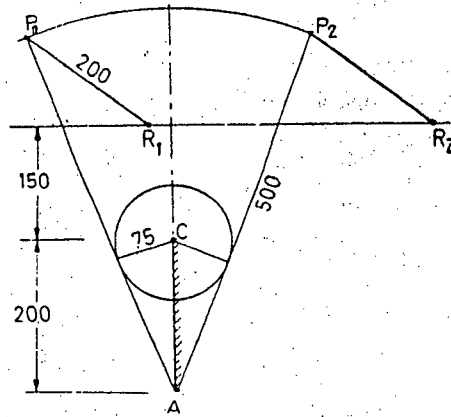

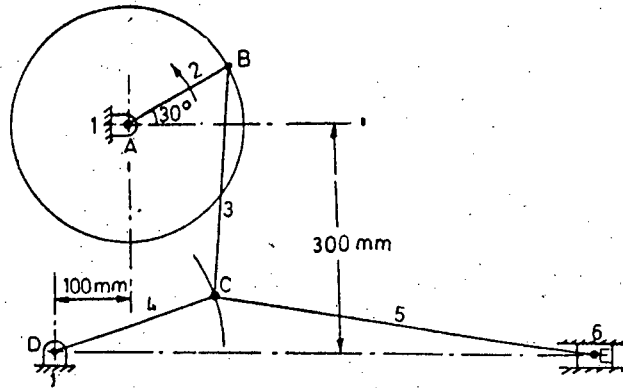
Fig. for Q. No. 5(b)

All dimensions in mm

Fig. for Q. No. 6(b)

Fig. for Q. No. 7(b)

Fig. for Q. No. 8